COMPARISON OF MOST CONSERVATIVE CRESTAL SINUS LIFT (MCSL) WITH LATERAL WINDOW APPROACH

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DEPARTMENT OF

ORAL AND MAXILLOFACIAL SURGERY

CERTIFICATE

This is to certify that this dissertation entitled **"Comparison of Most Conservative Crestal Sinus Lift (MCSL) with Lateral Window Approach"** is a genuine work done by **Dr. Segin Chandran K.R.** under my guidance during his **post** graduate study period between 2009-2012.

This Dissertation is submitted to THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY in partial fulfillment for the Degree of MASTER OF DENTAL SURGERY IN ORAL AND MAXILLOFACIAL SURGERY, BRANCH III**.** It has not been submitted (partial or full) for the award of any other degree or diploma.

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CONTENTS

INTRODUCTION

" Inveni quod deficiens" old latin saying , meaning "recover what is lost "simply reminds us the duty of a reconstructive maxillofacial surgeon to recover the lost segments in maxillo facial region due to physiologic or pathologic changes.

Prosthetic rehabilitation of missing organs have existed for centuries. Prosthetics simply meant replacement of missing limbs but now it's capable of replacing most parts of the body giving back form as well as function to have extremely active lives.

Ambrose Pare (1536), surgeon to England Royal family performed the first amputation and replaced the same with an artificial limb. He is considered to be the father of modern prosthetics.

Increased awareness and demand from patients for the conservation of remaining teeth in prosthetic rehabilitation led to the evolution and popularization of Dental Implants[9].

In 1952 the Swedish orthopaedic surgeon, PI Brånemark during his research at Cambridge University to study blood flow in vivo, placed titanium chambers into the ears of rabbits. He observed that bone had grown into such close proximity with the Titanium and it adhered to the metal. He termed the clinically observed adherence of bone with titanium as 'Osseo integration'.[8]

In 1965 Brånemark, then Professor of Anatomy at Gothemberg University in Sweden placed his first titanium dental implant into a human volunteer named Gosta Larsen. From there through constant improvement in surgical protocols, upgradation in armamentarium and more knowledge in the field of bone physiology, Implantology grew as an accepted branch of dentistry. The Dental Implant gained its maximum popularity in the last 10 years.

Successful placement of implant is a challenge in posterior edentulous maxilla, where the alveolar bone is lost due to extensive resorption, the presence of maxillary sinus and spongy nature of bone.[16] In clinical practice patients with the residual alveolar ridge height of less

than 10 mm, considered to be the minimum bone required for ideal placement of dental implants were not uncommon.[51] This lead to the evolution of different floor augmentation procedures.

Different techniques were tried using Onlay grafts, Interpositional (Lefort I) grafts , Inlay grafts for Sinus floor, Sinus-lift etc. by different surgeons. But few of them preferred shorter implants. Shorter implants are not well accepted by implantologists because of less crown root ratio[22].

Use of bone graft in sub sinus area to increase the bulk of bone in the posterior maxilla for subsequent ridge reduction for achieving interarch distance for prosthodontic rehabilitation was first done by Dr. Phillip J. Boyne in 1960s (US Navy dental school lectures 1965-1968). Dr. Philip J Boyne and James authored the first publication on this technique in 1980.[4]

Sinus-lift procedure for dental implant placement was first performed by Dr. Hilt Tatum in 1974 in Lee County Hospital in Opelika,

Alabama. This was followed by the placement and successful restoration of two endosteal implants.[53]

Summers technique published in 1994 still stands as the gold standard in routine maxillary sinus augmentation procedures as it is the most conservative procedure, easier to perform with fewer post operative complications compared to a lateral window technique.

Several modifications were suggested for crestal technique in the last few years in an intention to make it as atraumatic as possible, to reduce morbidity and to gain patients acceptance for the same.[48,49]

We study the predictability and feasibility of a new technique of crestal condensation (MOST CONSERVATIVE CRESTAL SINUS LIFT-MCSL) without raising flaps, using trephine for osteotomy and maximum conservation of bone which seems to be a promising one for doing routine sinus lift implant practice.

AIM

To introduce a new sinus lift technique for implant placement in deficient posterior maxillary ridge.

- with minimal trauma and associated morbidity
- maximum conservation of native bone
- minimising use of collagen membrane and bone grafts
- Immediate implant placement
- good primary stability
- less armamentarium and cost
- shorter surgery time
- shorter treatment duration
- less post operative complications

and to compare its advantages and disadvantages against traditional lateral window technique.

OBJECTIVE

Sinus lift in posterior maxillary area for placing implants using a lateral window technique created a lot of trauma and discomfort due to extensive flap rising beyond mucogingival junction.

Creating a bony window for the same and direct manipulation of Membrane was time consuming and associated with more morbidity. The procedure almost always required the use of collagen membrane and bone graft making it more expensive.

We found the need for a less traumatic, less expensive and less time consuming yet simple technique leading to uneventful sinus lift as well as immediate placement of implants.

REVIEW OF LITERATURE

BOYNE PJ, JAMES P A (1980)[4]

Introduced a new technique of using bone graft in sub sinus area to increase the bulk of bone in the posterior maxilla for subsequent ridge reduction for achieving interarch distance for prosthodontic rehabilitation.

TATUM H (1980) [53]

Wrote in this literature about doing Sinus-lift procedure for dental implant placement as he did it in Lee County Hospital in Opelika, Alabama, which was followed by the placement and successful restoration of two endosteal implants.

ERAN REGEV. DMD et al (1995) [16]

Describes the types of complications associated with posterior sinus augmentation and evaluates 8 cases reported with complications and concluded that the posterior maxillary implant placement with or without graft can be clinically successful and biologically sound with a

reasonably good prognosis if the possible complications are avoided or best managed in time.

RAGHOEBAR GM et al (1997) [44]

Studied the use of different autogenous bone grafts in sinus augmentation and immediate insertion of implants and concluded that augmentation of maxillary sinus floor with bone graft is a reliable option with promising short term results.

OREST G KOMANICKYJ et al (1998)[39]

Studied the success rate of single stage osteotome bone condensation and simultaneous dental implant placement with or without sinus lift, with a survival rate of 95.3 percentage.

GEOVANNI B BRUSCHI et al (1998) [22]

Introduced a new technique for those subsinus areas with less coronal as well as bucco palatal dimension which involve buccal expansion of residual alveolar ridge, sinus floor elevation and simultaneous implant placement in a single procedure.

NICOLA U ZITZMANN et al (1998) [37]

Compared both crestal and lateral wall approach evaluating post operative results with panoramic x-ray and computed tomography scans, he concluded that osteotome technique can be recommended when more than 6 mm of residual sub sinus bone height is available and 3-4 mm increase can be expected.

WATZEK G et al (1998) [56]

Did a retrospective study to evaluate the concept of doing a sinus lift procedure and placing implants in extremely resorbed maxilla by available techniques. His study group had an average vertical bone volume of 2.1 mm between the maxillary sinus and oral cavity before augmentation. He found the success rate ranging from 63 to 98%. According to this study the present treatment concept is reasonable and promising solution for patients with severely atrophied maxillae.

SUMMERS RB (1998) [49]

Suggested use of Osteotomes for bone condensation in sub sinus area, both apically as well as laterally by its advancement and gradually

changing to larger diameters for subsequent implant placement in augmented bone.

CRAIG M MISCH (1999) [11]

Proposed the advantage of removing wisdom tooth (impacted) and through the same incision gaining access to harvest ramus bone to augment posterior maxilla.

ANDRE MONTAZEM et al (2000)[1]

In their study to quantify the amount of bone graft material present in symphysis found than an average volume of 4.7-4.8 ml can be obtained by monocortical bone harvesting. In surgical procedures require same or less bone quantity, symphysis bone graft is an excellent choice with least donor site morbidity.

BERENGO M et al (2004) [5]

In this technical note authors describe the findings from intra operative use of Sinuscopy during sinus floor augmentation in terms of pattern of sinus membrane elevation, perforations, and confinement of graft material.

PHILIP J BOYNE (2004)[42]

In his research in monkeys to demonstrate the bone formation in subsinus areas, that was originally believed to be inactive and non productive of significant reparative bone, demonstrated to be an anatomical structure capable of formation of bone when properly stimulated surgically.

MUNA SOLTEN et al (2005)[34]

Studied the efficacy of Antral Membrane Baloon Elevation for sinus lift and evaluated the advantages and disadvantages. Apart from its other advantages, this technique is primarily used in edentulous area bounded by teeth and is difficult to access. Chances of balloon bursting due to more saline or quick inflation make this technique less popular.

FRANCESCO PAPA (2005)[19]

Studied the rate of loss of graft material from an augmented sinus site in 50 patient who had sinus lift operations and followed by bone graft of different origin. He found that rate of loss of hydroxyl appetite graft

material was least as compared to autogenous bone from iliac crest or bovine bone.

TE FU FRANK LI (2005) [54]

Published an eight year retrospective study results on a modified method of Summers Osteotome technique differing from original one that the use of graft is avoided. He concluded that the blood coagulum formed beneath the tented schneiderian membrane will be converted to the newly created osseous tissue. This technique is useful for residual bone ridge of 3mm to 4mm in height with a gain in sinus elevation of an average of 3.25 mm.

LEWIS CLAYMAN (2005) [30]

In this prospective study of success of implant placement in bone grafted maxilla to compensate atrophied sub sinus bone, 83% of implants survived in an average follow up period of 10 yrs. The crestal bone loss in survived implants were always less than 5 mm.

EMMANNOUIL G SOTIRAKIS (2005)[15]

Advocated use of hydraulic pressure to elevate the sinus membrane Hydraulic force replaced conventional curette to lift the sinus membrane the main indication for this technique was short edentulous span bounded by natural teeth.

STEFAN STUBINGER et al (2005) [48]

Described the efficacy of Piezosurgery instrument working in a ultrasonic modulated frequency that permits highly precise and safe cutting of hard tissue, but safe guarding nerves, vessels and soft tissue from injury as they target only mineralized hard tissue.

KENNETH L HALPERN et al (2006) [26]

In this single stage implant placement with flapless technique the bone augmentation in sub sinus area is done with Summers method with increasing diameter condensers with or without graft material. Esthetics, emergence profile, papilla preservation, proper orientation of implants and proper inter implant distance are the advantages of this method.

CHAWKET MANNAI et al (2006)[10]

Studied augmentation of maxilla and simultaneous placement of ITI implants in combination with small amount of intra oral autogenous grafts, larger amount of xenografts and purely Autologous Platelet Concentration (APC+) and concluded that this combination works well with good soft tissue and hard tissue healing.

FERNANDO TORELLA (2006)[18]

Studied the use of ultrasonic osteotomy for sinus -lateral wall perforation for sinus lift procedure and its advantage over conventional ostoetomy using diamond drills.

LINDEBOOM J A et al (2006)[27]

In his paper published on the results of randomized prospective controlled trial of antibiotic prophylaxis in intraoral bone grafting procedures – preoperative single dose penicillin versus preoperative single dose clindamycin. Even though pharmacokinetic point of view clindamycin is suitable for perioperative prophylaxis for maxillo facial

surgeries, a non– significant difference was found and Penicillin and its derivatives are still suitable for prophylaxis.

BYUNG HO CHOI et al (2006) [7]

Animal study conducted in rabbit head suggests the use of well accepted Cyanoacrylate to be used in closure of sinus membrane perforations during sinus lifts as a safe and reliable method.

LEON ARDEKIAN et al (2006) [29]

Did a retrospective study the clinical significance of sinus membrane perforation during maxillary sinus augmentation procedure and concluded that sinus perforation occurs more frequently when sinus is wide and residual bone height is less. This article gives classification of sinus membrane perforations and management of the same.

SHAHRAM EMTIAZ DDS et al (2006) [47]

Suggested that a new technique in preparing a lateral window to reach subsinus area using a trephine punch on lateral wall of maxillary sinus and using the same punched bone to cover osteotomy site.

ANDREAS THOR et al (2007) [2]

Evaluated a new lateral wall technique with immediate implant placement in cases with sub sinus bone ranging from 4-10 mm. Crestal placement of implants after visualizing them through lateral window without grafting created a tenting effect on mucosa which was filled with blood coagulum ,which in turn enhanced the new bone formation. It was suggested that the use of this technique can reduce the risk for morbidity related to harvesting of bone grafts and eliminate the cost for grafting material.

ANTHONY G SCALAR (2007) [3]

Reviews the advantages and disadvantages of and indications and contraindications for flapless implant surgery with special emphysis on requirements for establishing and maintaining long term health and stability of per implant soft tissues.

ROBERT FERMERGARD et al (2007) [43]

Evaluates the efficacy of Osteotome sinus floor elevation without bone grafting in posterior maxilla and placement of 51 implants in 36 patients and found to be producing predictable results.

SIMUNEK A et al (2007) [51]

Gave a strong supporting article for lateral window technique after evaluating 1000 surgeries, stating that despite having some disadvantages it is one of the most effective method for implantation in to the posterior maxilla. He concludes by saying that the technique demands more precision and expertise from surgeon but it is safe in the hands of an experienced surgeon.

CAWOOD J I AND P J W STOELINGA (2007) [8]

This article speaks about the evolution of pre-implant surgery from conventional pre-prosthetic surgery due to the introduction of endosteal implants. It avoided traumatic experience of sulcoplasty and other ridge augmentation procedures and eliminated the possible complications

associated with them like sagging chin, at the same time denture stability was much better due to implant retention.

FRANCOICE TILOTTA DDS et al (2008) [20]

Came out with observations from cadaveric study on trying trephines and osteotomes with stops to condense subsinus bone. Using a flap procedure in sinuses of 30 heads removed from fresh non preserved dissected to view sinus membrane during elevation, he demonstrated 4-6 mm of elevation of sinus membrane without impairing the mucosa.

JONAS P BECKTOR et al (2008) [25]

Did a prospective study on autogenous block bone graft harvested from ramus area and the same being used for sinus onlay grafting.

MILAN JURISIC (2008) [33]

Compares both Lateral window with Crestal technique, Immediate with delayed implant placement. He concluded that most predictable region for sinus augmentation and simultaneous implant placement was the maxillary premolar region.

STEVEN A ZIJDERVELD et al (2008) [52]

In this prospective study of 100 sinus lift procedures, authors say that anatomical variations such as presence of septa, thin lateral walls of maxilla, convexity of lateral wall and wide sinus etc contribute a large extent to sinus perforation during sinus floor elevation methods, Thorough evaluation of Sinus anatomy, residual bone quantity and quality and proper selection of method will reduce the incidence of complications.

YOUNG– KYUM KIM et al (2008) [57]

Suggests the placement of pedicled Buccal Fat Pad as a barrier membrane below the perforated sonus membrane before grafting as a successful option.

SUNITHA V RAJA (2009) [50]

Reviewed different techniques of both crestal and lateral wall approaches in terms of its long time success rate and ease of procedure and concluded that success rate depends on the clinical skill and experience of the performer as most of the techniques are sensitive.

NELSON KIM – HUNG AU YEUNG (2009) [35]

Suggest a two stage technique in which trephined bone mixed with allograft material was placed after sinus membrane elevation and simultaneous placement of wide diameter implant Morbidity is reduced as only one surgical site is involved.

METODI ABADZHIEV (2009) [32]

Reviews three alternative methods to do sinus lift - Summers floor dialatation method, Baloon Sinus lift and hydropneumatic sinus lift (Intra lift).

SROUJI S et al (2010)[46]

Studied osteogenic potential of schneiderian membrane in animal model simulating sinus lift confirmed the osteogenic activity even without the presence of an osteoconductive graft material.

PAVLIKOVA G et al (2010) [41]

Did a review of literatures from 1998 to 2010 on piezosurgery suggested by Italian Oral Surgeon Thomaso Versallotti. Sinus Lift was

the first maxillo facial surgical procedure done with piezo surgery. In his review he concluded that piezo surgery allows very precise cutting sparing soft tissues such as brain, duramater, palatal mucosa and the inferior alveolar nerve and Schneiderian membrane.

BUYUKKURT M C et al (2010) [6]

Studied the feasibility of intraoral grafts for sinus lift using CT scan and MIMICS software. He concluded that symphysis graft gives adequate volume for sinus augmentation procedures with less post operative morbidity. He quoted "Cresp et al" to say that membranous bone grafts resorb less as compared to endochondral bone graft.

LARS °KE JOHANSSON et al (2010)[28]

Compared the bone loss in apical and crestal areas of implants placed in posterior maxilla using autogenous bone grafts from implant site itself using bonegraft collected by means of bone collector during drilling or by means of bone scraper and reported that autogenous bone is the best choice regardless of technique used.

DONG- SEOK- SOHN (2010)[13]

Tried absorbable gelatin sponge as a sub sinus graft material with lateral window approach and found to be effective.

LUDOVICO SHORDONE (2010) [31]

Sinus lift by modified Cald well-Luc procedure in which iliac crest block bone inlay was grafted, the implant placement when delayed gave much promising results minimizing their potential complications.

SAMUEL LEE et al (2010)[45]

He describes an open, crestal, waterless trephination osteotomy to reach sinus membrane and directly rising it with specially designed instruments and then placing trephined bone as graft. But direct manipulation makes this technique sensitive.

PAUL ROUSSEAU M D (2010)[40]

In his article after comparing traditional and flapless surgery concluded that, Flapless procedure is predictable when patient selection and surgical technique are appropriate.

DU-HYEONG LEE et al (2010) [14]

Results from an animal study conducted in Yonsei University South Korea was taken to set guidelines for the use of soft tissue punches and studied the effects of the same in healing of peri implant site. They suggest use of a punch slightly narrower than the implant to get optimum results.

HO-YEOL JANG ET AL (2010) [24]

Published this journal on the basis of the fact that graft integrity in sub sinus area depends on how good the reflection of sinus membrane is from medial wall of Sinus to receive the vascular supply and for better osteoconductive effects

GERALDO NICOLAU RODRIGUES (2010) [23]

This article shows the efficiency of Zimmer Sinus lift Balloon minimally invasive technique" to gently elevate the schneiderian membrane in both alveolar ridge and lateral maxillary window surgical approaches.

NURIA FAREE – PAGES (2011) [36]

In this latest literature author describes a new technique to do lateral window approach using trephine (SLA system) held perpendicular to the lateral wall allows better access and minimizes the risk of perforations.

VERNAMONTE S et al (2011) [55]

Reports the incidence of an intense Benign Peroxismal Positional Vertigo (BPPV) as a sequel after Osteotome Sinus Floor Elevation and describes the clinical features and treatment for the same. Author emphasize the need for including this unusual complication in the consent form.

MATERIALS AND METHODS

A prospective clinical study, evaluating the simplicity, ease of the technique, and post operative complications between lateral window technique and Most Conservative Sinus Lift (MCSL) was undertaken. The study was done in the Department of Oral and Maxillo Facial Surgery, Rajas Dental College and Hospital, Kavalkinaru, Tamilnadu.

Criteria for selection

Inclusion criteria:

- Average Age : 35-45 years
- Healthy individuals with informed consent
- Missing tooth / teeth in the posterior maxilla,
- History of minimum 6 months of post extraction period
- All non smokers and non-alcoholics
- with no pre existing sinus diseases
- sub sinus bone less than 7mm in height
- an average Crown Height Space (CHS) measuring 15 mm

- Adequate mesio distal span 8mm
- Bucco palatal width 7 mm.

Exclusion Criteria:

Samples who had

- Systemic conditions contra indicating implant placement
- Pre existing sinus diseases/ surgeries
- patients with extremes of age group
- Heavy Smoker/ Alcohol intake
- No motivation
- Inadequate edentulous span
- Unfavorable inter arch distance
- Inadequate mucosal thickness in edentulous area
- Maxillary Sinus with Septae

PROFORMA

Name :

Age /Sex :

OP no :

Address :

Chief Complaint

History of presenting Illness

Past Dental History

Personal History

General Examination

Intra Oral Examiation

Hard tissue Examination

Inspection

No of teeth present

Missing teeth

Site selected for Implant placement

Evaluation of adjacent teeth –

Angulation / Supra Eruption / Caries / Periodontal status

Evaluation of opposing teeth--

Angulation / Supra Eruption / Caries / Periodontal status

Inter arch distance in edentulous area

Mesio distal distance between adjacent teeth

Width of residual alveolar ridge

Soft Tissue Examination

Inspection

Inspection of overlying mucosa

Colour

Texture

Tone

Palpation

Thickness of overlying soft tissue (probing method)

Consistency

Assessment of residual bone width

(Total ridge width – soft tissue thickness)

Investigations

IOPA / RVG

OPG

CT Scan Maxilla

Radiographic Evaluation

Diagnosis

Treatment Plan

MCSL / Lateral Window

Surgery

Duration of Surgery

Date of Sinus Lift Surgery

Date of Implant placement

Type of Implant used

Intra operative use of Collagen membrane Yes / No

Use of Bone graft Yes / No

Sutures used Yes / No

Primary stability of Implant placed

Post Operative Evaluation

Duration	Immediate	1 week	2 week	1 month	2 months	4 months	6 months
Mobility of Implant							
Swelling							
Pain							
Maxillary Sinusitis							
Soft tissue healing							
Anaesthesia/ Parasthesia							
Sinus lift achieved							

LATERAL WINDOW TECHNIQUE

Case selection and Radiographic Evaluation

A category of implant patients whose radiographs showed a sub sinus bone height of 5-8 mm with treatment option subantral (SA)-3 were selected. Informed consent was taken before surgery. (Fig L1)

Prophylactic Medications

Tab Augmentin 625 mg twice daily started 1day prior to surgery after test dose and continued for 5 days.

Preparation and Antisepsis

Aseptic theatre protocol was maintained, Pre operative rinsing with Clohex mouth wash.

Anaesthesia

Local Anesthesia 2% Lignocaine with adrenaline (1:80000).

Incision Line and Reflection of flap

Crestal incision was placed on palatal side. It was extended it to the buccal side using a releasing incision disto buccaly and an anterior

vertical incision mesio buccaly was made 10 mm anterior to the estimated anterior vertical wall of antrum. A full thickness broad based mucoperiosteal facial flap was raised to expose the complete lateral wall of maxilla and part of zygomatic prominence. Reflected flap was secured to labial mucosa with 2-0 silk for avoiding interference during procedure (Fig L 2).

Access Window

The outline of lateral window was scored on bone with No.6 diamond bur running at 2000 rpm. Window marked with lower margin 2-5 mm above the floor of the sinus, Anterior vertical line 5 mm distal to anterior vertical wall of antrum, Superior margin is 8-10 mm above the score line. Distal vertical line was 15 mm from anterior one. Corners of window is rounded off. The rotary round bur continued to score the outline with a paint brush stroke with cooled sterile irrigation until a bluish hue was observed (Fig L 3).

Sinus membrane Elevation

A flat ended metal punch (mirror handle) was used to gently infracture the lateral access window from surrounding bone while it was still attached to sinus membrane. Using special elevators-sinus membrane was lifted from inferior, anterior, and posterior attachments and was raised to form an inferior boundary for sinus and superior boundary for subantral space (Fig L 4).

Placement of bone graft

After giving an additional membrane protection using CollaTape® Soaked with Cebanex (Cefaperazone + Sulbactum) IV in the roof of subantral cavity, the bone graft mixture, a combination of Autogenous tuberosity bone graft, Human Demineralised Freeze-Dried Bone Allograft (DFDBA) and platelet rich plasma (PRP) was placed and was secured in place by another membrane CollaTape® (Fig. L 5, 6, 7, 8, 9, 10).

Wound Closure

Flap was closed using 3-0 vicryl with horizontal mattress technique.

Post-Operative Medications

Antibiotic were continued up to 5 days post operative Nasal decongestant Otrivin nasal Spray (Oxymetazoline 0.05%) was used 3 times daily for three days post operatively Tab Dexona 0.5 mg in a decreasing dosage from1day prior to surgery two days post operatively Tab Ultracet 500 mg bd dose for 5 days.

Second Stage Surgery

Delayed implant placement was done after a minimum period of four months with Division A root form implants with 4.3mm diameter and 10 mm length (Nobel Biocare Replace Select) (Fig. L 11).

Implant exposure and abutment fixation

Under topical anaesthesia using probing method the implant head was identified and the same was exposed using a soft tissue punch Cover screw was removed and the abutment was fixed.

Prosthetic Rehabilitation

A crown was delivered as per standard prosthetic protocol.

MOST CONSERVATIVE SINUS LIFT TECHNIQUE (MCSL)

Case selection and Radiographic Evaluation

A category of implant patients whose radiographs showed a sub sinus bone height between 5-8 mm with treatment option subantral SA-3 were selected. Informed consent was taken before surgery. **(Fig MC-1)**

Prophylactic Medications

Tab Augmentin 625 mg twice daily started 1day prior to surgery after test dose and continued for 5 days.

Preparation and Antisepsis

Aseptic theatre protocol was maintained, Pre operative rinsing with Clohex mouth wash Scrubbing, painting patients face with Betadine ® and draping Sterile gowns and gloves for surgeon as well as assistant.

Anaesthesia

Local Anaesthesia 2% Lignocaine with adrenaline (1:80000) given as Posterior superior alveolar nerve block and infiltrations.

Soft tissue punch

Soft tissue punch smaller than proposed Implant diameter was selected (3.5 mm for 4.3 diameter implant) keeping 1.5 mm spacing from adjacent teeth mesio distally. Soft tissue was punched in full thickness exposing crestal bone. **(Fig MC-2,3,4)**

Trephine to cut sub sinus bone

Same diameter trephine as that of soft tissue punch is used to make the bone cut through punched soft tissue window. Cut was limited to 2 mm of the radiographic margin superiorly. Trephined bone was left in place by gentle removal of trephine. **(Fig MC- 5)**

Osteotome Condensation

Osteotome of same diameter of trephine is used to condense D3 type of bone to D2 type and to push it apically as much as possible and then to indirectly fracture the sinus floor and to elevate as desired. **(Fig MC- 6,7)**

Implant Placement with Abutment and Healing Cap

Immediately after the condensation the larger diameter implant was inserted and wrenched in to achieve lateral condensation as well as primary stability. Abutment was given at the same time as that of implant placement above which the healing cap was given for soft tissue contouring around implant. **(Fig MC- 8,9,10)**

Post Operative Medications

Antibiotic was continued up to 5 days post operative nasal decongestant Otrivin nasal Spray (Oxymetazoline 0.05%) was used 3 times daily for three days post operatively Tab Dexona 0.5 mg in a decreasing dosage from1day prior to surgery to two days post operatively Tab Ultracet 500 mg bd dose for 5 days.

Prosthetic Rehabilitation

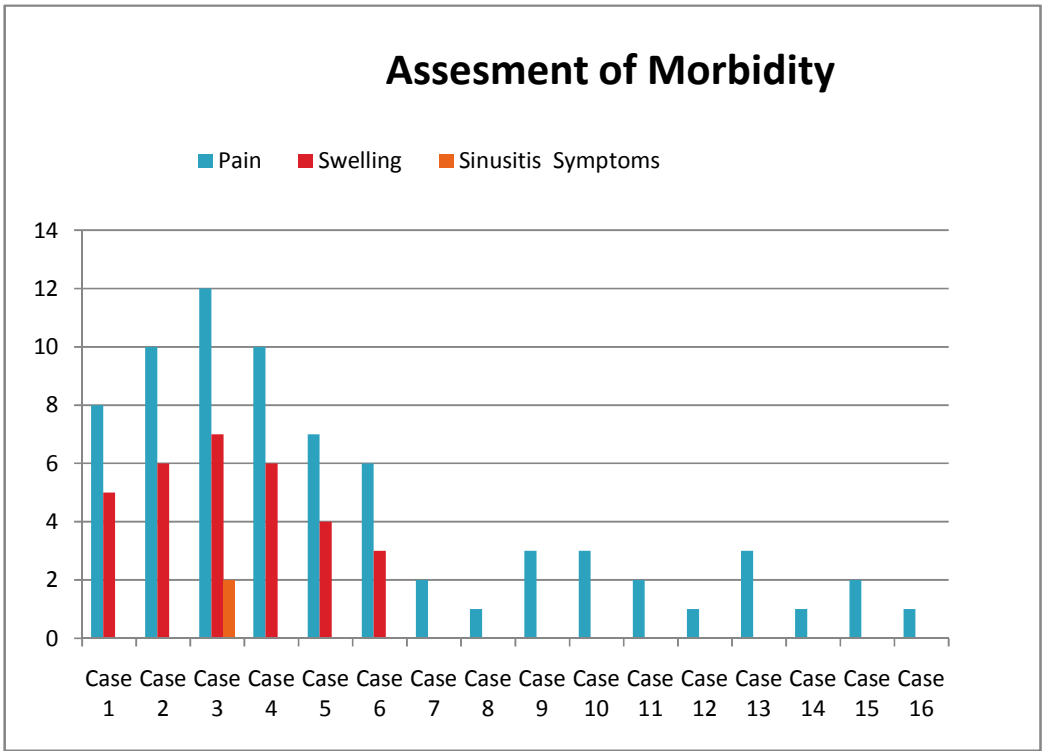
After healing period of 4 months, a crown was given after rubber base impression and it's given with Implant protective occlusion. (Fig MC-11,12)

RESULTS

All variables, which include the amount of morbidity after the procedure, ease of doing the procedure, primary stability of implant placed, duration of surgery to do sinus lift, total duration of the treatment, possibility of placing implants soon after the sinus lift, incidence of sinus membrane perforation and sinusitis, Requirement of collagen membrane, and bone graft were assessed. The data obtained were tabulated and analyzed.

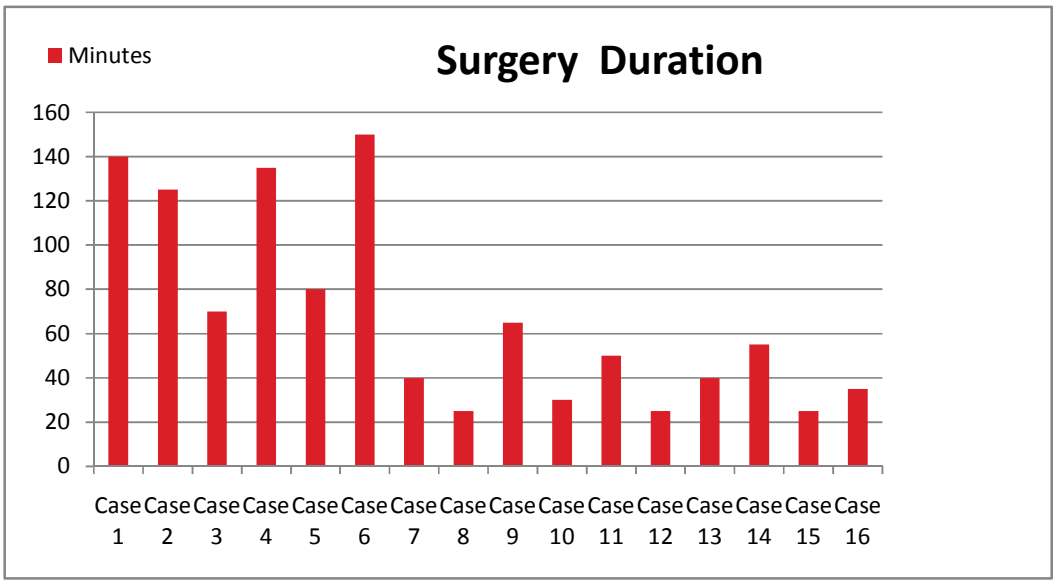
Morbidity after Procedure

Out of 11 patients 6 underwent lateral window technique and 10 for MSCL All lateral window technique patients had a period of 5-12 days of morbidity Signs of mild sinusitis was noted only in one patient for 2days like heaviness and nasal blockage on the ipsilateral side with maximum 12 days of post operative morbidity . All 10 cases done with MCSL had a morbidity period of 1-3 days. **(Table - 1)**



DURATION OF SURGERY

Assessing procedural time, the time taken for MSCL surgery was much less compared to conventional lateral window technique. **(Table- 2)**

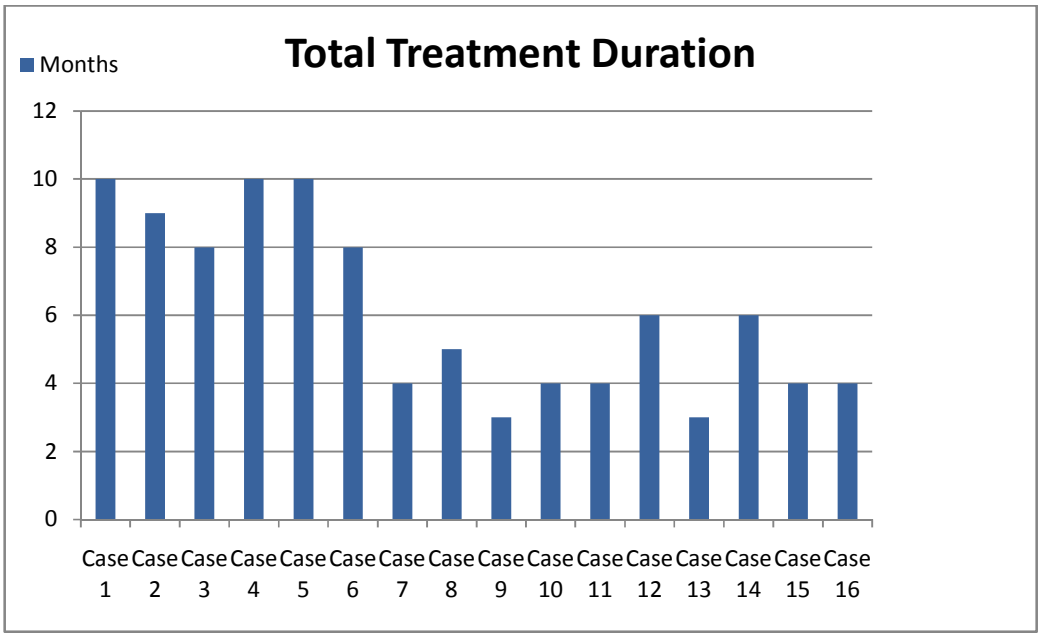


BIO-MATERIALS USED

Direct manipulation of sinus membrane and use of bone graft in lateral window technique demanded the use of collagen membrane closure of the flap was done with 3-0 vicryl in all the lateral window technique cases. Soft tissue punching and indirect manipulation of schneiderian membraine avoided the use of biomaterials in MCSL. **(Table -3)**

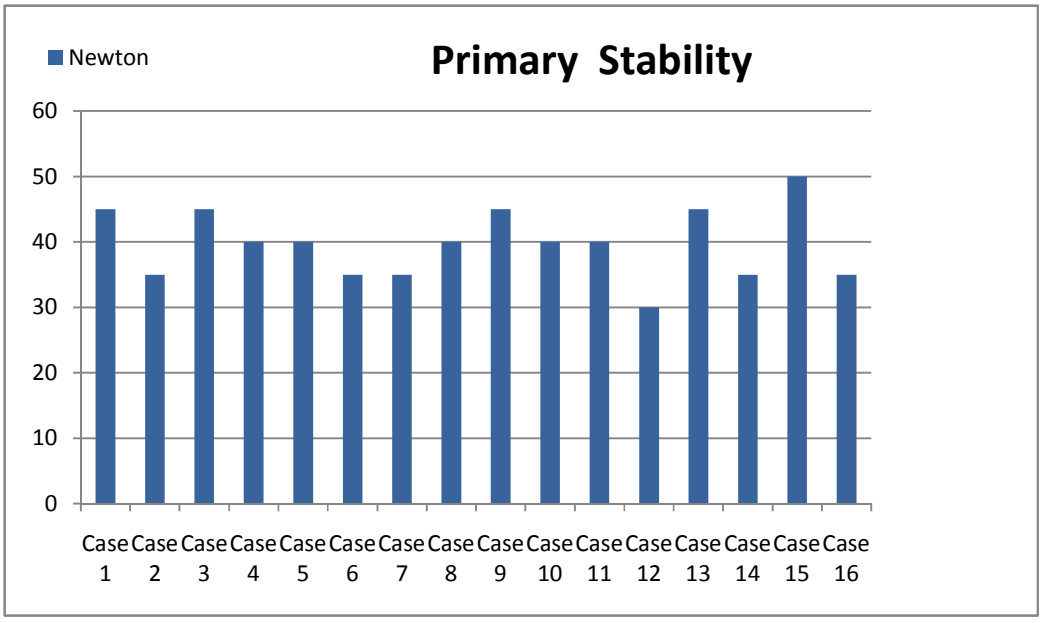
TOTAL DURATION OF TREATMENT

In lateral window technique the use of born graft demands longer time for born remodeling after the sinus lift before the implant placement. Implant placed in grafted sinus need to wait more time to get loaded (3 months + 1 month for every mm height achieved with graft). In MCSL since no born graft used and placement of implant with abutment was done immediately after sinus lift with good primary stability but drastically reducing the total treatment duration. **(Table-4)**



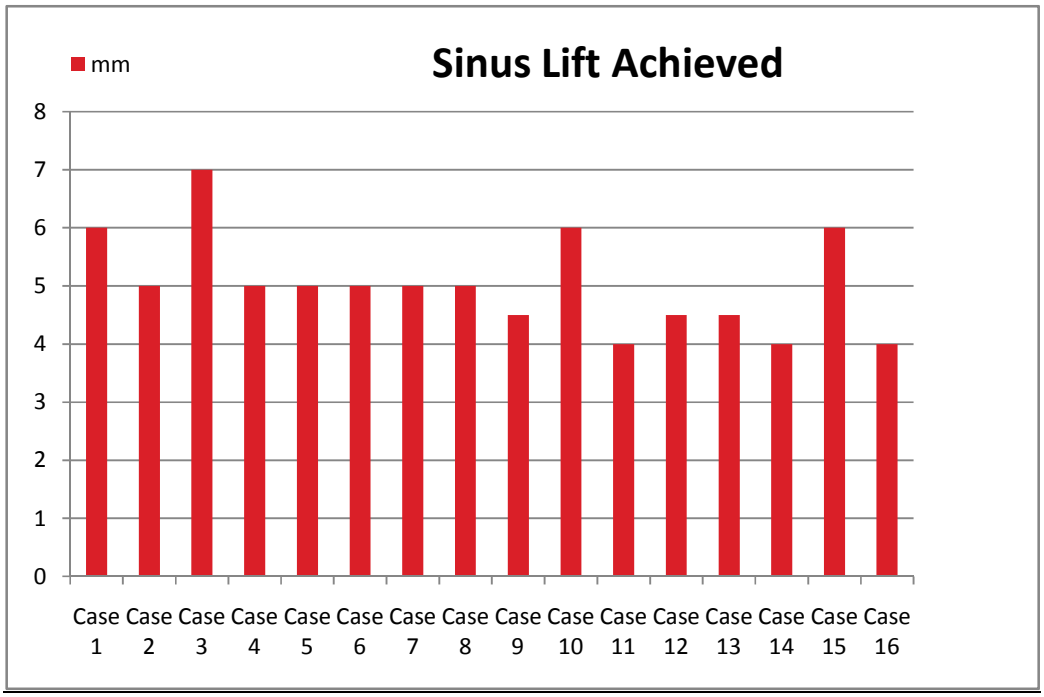
PRIMARY STABILITY

We could not find any significant difference between the primary stability achieved during the implant placement in both lateral windows as well as in MCSL. (**Table-5**)



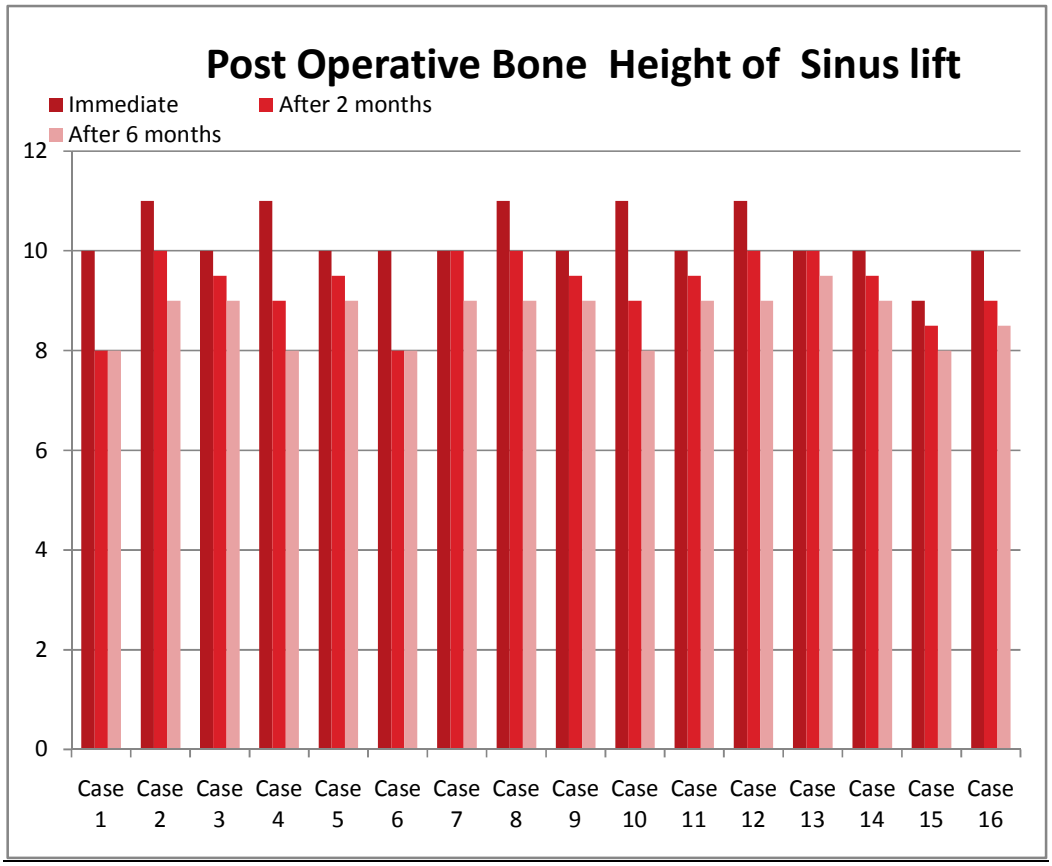
AMOUNT OF SINUS LIFT ACHIEVED

It was found that there was a mild reduction in the height achieved by MCSL than the regular lateral window technique. **(Table-6)**



POST OPERATIVE SUB SINUS BONE HEIGHT

Amount of born reduced from sub sinus area after sinus lift achieved and implants placed were in the same rate both in lateral window as well as MCSL. **(Table-7)**


Post Operative Bone Height of Sinus lift
Immediate
After 2 months
After 6 months
12
10
8
6
4
2
0
Case 1
Case 2
Case 3
Case 4
Case 5
Case 6
Case 7
Case 8
Case 9
Case 10
Case 11
Case 12
Case 13
Case 14
Case 15
Case 16

ASSESSMENT OF MORBIDITY

Table 1

Case	*Pain*	*Swelling*	*Symptoms of Sinusitis*
1. Rekha Manoj	8 days	5 days	Nil
2. Joseph	10 days	6 days	Nil
3. Sugathan	12 days	7 days	2 days
4. Prema	10 days	6 days	Nil
5. Oliver Austin L	7 days	4 days	Nil
6. Gracy Helen	6 days	3 days	Nil
7. Lekha	2 days	Nil	Nil
8. Easwary	1 day	Nil	Nil
9. Udayakumar	3 days	nil	Nil
10. Sam George	3 days	nil	Nil
11. Siva kani	2 days	nil	Nil
12. Esakki Amma	1 day	Nil	Nil
13. Abdul Hakkim	3 days	Nil	Nil
14. Sreemathi	1 day	nil	Nil
15. Carmel George	2 days	nil	Nil
16. Koshy Ipe	1 day	nil	Nil

DURATION OF SURGERY

Table 2

Case	*Less than 30 min*	*More than 30 min*	*More than 1 hour*	*More than 2hours*
1. Rekha Manoj				140
2. Joseph				125
3. Sugathan			70	
4. Prema				135
5. Oliver Austin L			80	
6. Gracy Helen				150
7. Lekha		40		
8. Easwary	25			
9. Udayakumar			65	
10. Sam George	30			
11. Siva kani		50		
12. Esakki Amma	25			
13. Abdul Hakkim		40		
14. Sreemathi		55		
15. Carmel George	25			
16. Koshy Ipe		35		

BIO-MATERIALS USED

Table 3

Case	*Collagen Membrane*	*Bone Graft*	*Sutures*
1. Rekha Manoj	yes	yes	yes
2. Joseph	yes	yes	Yes
3. Sugathan	yes	yes	yes
4. Prema	yes	yes	yes
5. Oliver Austin L	yes	yes	yes
6. Gracy Helen	yes	Yes	yes
7. Lekha	No	No	No
8. Easwary	No	No	No
9. Udayakumar	No	No	No
10. Sam George	No	No	No
11. Siva kani	No	No	No
12. Esakki Amma	No	No	No
13. Abdul Hakkim	No	No	No
14. Sreemathi	No	No	No
15. Carmel George	No	No	No
16. Koshy Ipe	No	No	No

TOTAL DURATION OF TREATMENT

Table 4

Case	*Date of Surgery*	*Date of Implant Placement*	*Date of implant exposure*	*Date of crown Placement*	*Total Duration*
1. Rekha Manoj	03-09-10	30-01-11	21-07-11	28-07-11	10 months
2. Joseph	20-09-10	04-02-11	15-06-11	24-06-11	9 months
3. Sugathan	31-09-10	18-02-11	30-07-11	10-08-11	8 months
4. Prema	07-06-10	10-10-10	23-04-11	30-04-11	10 months
5. Oliver Austin L	06-08-10	07-12-10	18-06-11	25-06-11	10 months
6. Gracy Helen	05-07-10	25-11-10	20-03-11	29-03-11	8 months
7. Lekha	02-10-10	02-10-10	Nil	28-02-11	4months
8. Easwary	25-09-09	25-09-09	nil	04-03-11	5months
9. Udayakumar	31-09-10	31-09-10	nil	10-08-11	3 months
10. Sam George	07-04-10	07-04-10	nil	30-08-10	4 months
11. Siva kani	06-08-10	06-08-10	Nil	10-12-10	4 months
12. Esakki Amma	05-07-10	05-07-10	nil	11-01-11	6 months
13. Abdul Hakkim	11- 12-10	11-12-10	nil	03-03-11	3 months
14. Sreemathi	07-02-11	07-02-11	nil	23-08-11	6 months
15. Carmel George	26-03-11	26-03-11	nil	15-07-11	4 months
16. Koshy Ipe	15-04-11	15-04-11	nil	09-08-11	4 months

PRIMARY STABILITY

Table 5

Case	*10-20 N*	*20-30 N*	*30-40 N*	*> 40 N*
1. Rekha Manoj				45
2. Joseph			35	
3. Sugathan				45
4. Prema			40	
5. Oliver Austin L			40	
6. Gracy Helen			35	
7. Lekha			35	
8. Easwary			40	
9. Udayakumar				45
10. Sam George			40	
11. Siva kani			40	
12. Esakki Amma			30	
13. Abdul Hakkim				45
14. Sreemathi			35	
15. Carmel George				50
16. Koshy Ipe			35	

AMOUNT OF SINUS LIFT ACHIEVED

Table 6

Case	*Initial sub sinus Bone Height*	*Sub Sinus bone height after Sinus Lift*	*Sinus Lift Achieved*
1. Rekha Manoj	5 mm	11 mm	6 mm
2. Joseph	6 mm	11 mm	5 mm
3. Sugathan	5 mm	12 mm	7 mm
4. Prema	6 mm	11 mm	5 mm
5. Oliver Austin L	7 mm	12 mm	5 mm
6. Gracy Helen	5 mm	10 mm	5 mm
7. Lekha	5 mm	10 mm	5 mm
8. Easwary	6 mm	11 mm	5 mm
9. Udayakumar	5.5 mm	10 mm	4.5mm
10. Sam George	5 mm	11 mm	6 mm
11. Siva kani	6 mm	10 mm	4 mm
12. Esakki Amma	6.5mm	11 mm	4.5 mm
13. Abdul Hakkim	5.5 mm	10 mm	4.5 mm
14. Sreemathi	6 mm	10 mm	4 mm
15. Carmel George	5 mm	11 mm	6mm
16. Koshy Ipe	6 mm	10 mm	4 mm

POST OPERATIVE SUB SINUS BONE HEIGHT

Table 7

Case	*Bone level immediately after the surgery*	*Bone height After 2 months*	*Bone height After 6 months*
1. Rekha Manoj	10 mm	8 mm	8 mm
2. Joseph	11 mm	10 mm	9mm
3. Sugathan	10 mm	9.5 mm	9mm
4. Prema	11 mm	9 mm	8mm
5. Oliver Austin L	10 mm	9.5 mm	8.5mm
6. Gracy Helen	10 mm	8mm	8 mm
7. Lekha	10 mm	10 mm	9 mm
8. Easwary	11 mm	10 mm	9mm
9. Udayakumar	10 mm	9.5 mm	9mm
10. Sam George	11 mm	9 mm	8mm
11. Siva kani	10 mm	9.5 mm	9mm
12. Esakki Amma	11 mm	10 mm	9 mm
13. Abdul Hakkim	10 mm	10mm	9.5 mm
14. Sreemathi	10 mm	9.5 mm	9mm
15. Carmel George	9 mm	8.5mm	8mm
16. Koshy Ipe	10 mm	9mm	8.5 mm

DISCUSSION

Implant placement in posterior maxilla is a greater challenge due to loss of alveolar bone height and antral pneumatisation[16]. Reduction in quantity and quality of bone in posterior maxilla resulted in insufficient anchorage, questionable integration, and unfavourable crown-root ratio.

It has been quoted that a minimum of 10 mm of bone height is necessary for successful implant stabilization and integration[51]. Sinus lift is one of the options to overcome subsinus bone deficiency in posterior maxilla.[4,58] Several modifications and alternatives were suggested for the same in recent years as the implant dentistry is getting popular.[50] The search for methods to avoid trauma and morbidity associated with lateral wall technique led to the evolution of crestal methods done in the most atraumatic way.[48,49]

Different modifications of summers osteotome technique were tried using Trephines[47,45], Hydraulic Sinus Condensation (HSC)[15], Antral Membrane Balloon Elevation (AMBE)[34,23], Piezo electric

(Intralift)[41] etc. A group of patients in the category of residual bone height of 5-10 mm was found to be in border line between direct and indirect sinus lifts. Our aim in such patients were to give a total sub sinus bone height of 10 mm or more with augmentation of posterior maxilla and to improve quality of bone by which the primary stability of the implant improves.

Even though the trauma and morbidity associated with conventional crestal techniques are far less compared to lateral wall one, there was always demand for more precise and predictable, at the same time less traumatic way of doing sinus lift. Many alternative methods were suggested [32].

The new concept of Most Conservative Crestal Sinus Lift procedure (MCSL) fulfils almost all demands.

The concept was evolved by combining many procedures published in the past, suggested for conservative and safe sinus lift. It was done in a group of patients with sub sinus bone height 5-10 mm,

classified by Carl Misch as Sub antral treatment option 3 (SA-3)[9] and suggested lateral window technique.

Literature also suggests the use of osteotome technique when residual bone height is more than 6mm and 3-4 mm of sinus lift is indicated.[37]

In our study out of 16 cases 10 were done with new MCSL (Most Conservative Crestal Safe Sinus Lift) and 6 cases with traditional Lateral window technique and resuls were tabulated and analyzed.

Lateral window technique was done by raising a muco periosteal flap exposing lateral wall of maxilla, this reflection was the main reason for post operative oedema and pain. But in case of MCSL since it is a flapless technique making use of soft tissue puch pain and swelling were minimal[39,3,40,26]. Soft tissue punch of lesser diameter than the implant was used to get optimum peri implant healing[14]. By this method periosteal detatchment was minimum thus periosteal blood supply was

maximum to bone, giving adequate soft tissue healing in no time with good emergence profile due to sufficient mucosal thickness.

Bony window made on the lateral wall of maxilla in lateral window technique gives direct access to the schneiderian membrane.[24,36,33,47]

Separation of membrane is a technique sensitive procedure and its prone for perforation, It occurs more when bucco palatal width of sinus is wide and residual bone height is less.[29,52] But adequate reflection of sinus membrane from medial wall of sinus is a must to receive good vascularity and for better osteo conductive effects for the grafts.[24] Osteogenic potential of schneiderian membrane also contributes to the new bone formation and remodelling in sub sinus area.[46,42]

The ease of procedure and long term success rate of both lateral window as well as MCSL depends on the clinical skill and experience of the performer as most of these procedures are technique sensitive.[50,51]

For doing lateral window technique the bony window was removed, sinus membrane was elevated and protected with a collagen

membrane. A mixture of autogenous and allogenous bonegraft mixed with PRP was used. Another collagen membrane was used to protect the graft and to close the access cavity.

The bone graft was harvested either from symphysis[1,6] or the ramus[11] of mandible to use in lateral window technique [44,31]. This is quite promising procedure with literature to support its long term success rate and less crestal bone loss.[30,25]

The duration of the sinus lift procedure was much less in MCSL as compared to lateral window technique, it needs less armamentarium Since no bone graft and collagen membrane were used the procedure was less expensive.

Bone trephination was done using a smaller diameter trephine (Salvin ®) and trephined bone was left in place to act as a shock absorber. Crestal bone was condensed apically using graduated summers modified osteotome for a length of 10 mm, condensing D3 type of bone to D2.

This along with the lateral condensation achieved during the placement of large diameter implant provided good primary stability.[35]

Further apical condensation indirectly fractured the sinus floor to elevate it as necessary. The blood coagulum beneath the tented sinus membrane gets converted in to osseous material.[54] No additional graft material was used this shortens the bone remodeling time and immediate placement of implant was possible.[33,43] Abutment given along with the implant and soft tissue healing cap avoided a second stage surgery and reduced treatment time drastically.

Surgeons inability to visualize anatomical landmarks and vital Structures, inability to control thermal damage due to reduced access for external irrigation during osteotomy, the increased risk of malposed angle or incorrect depth of implant placement, a decreased ability to contour osseous topography when needed, inability to modify the emergence profile are some of the possible drawbacks mentioned in literature for doing a flapless technique Crestal condensation techniques are reported with fewer complications as BBPV (Benign Paroxysmal Positional

Vertigo). Even though MCSL being a crestal condensation technique, such complications were not reported in our study.[55]

All variables like amount of morbidity after the surgery, ease of doing the procedure, primary stability of implant placed, duration of surgery to do sinus lift, total duration of the treatment, possibility of immediate implant placement, incidence of sinus membrane perforation and sinusitis, requirement of collagen membrane and bone graft were analyzed.

Prophylatic medication found to be effective in both the types of sinus lifts and showed almost no sign of post operative infection. According to the results found in this study the morbidity associated with lateral window technique is more compared to MCSL. Only one patient with lateral window technique reported with symptoms of sinusitis which resolved in two days time.

Total treatment time was much less in MCSL (3-6 months) as compared to Lateral window technique (6-12 months).

All lateral window cases had bone grafting done and had to wait for a period of 3-5 months time before the implants were placed but in all 10 MCSL cases immediate placement of implants with abutments was possible.

In all lateral window technique cases collagen membrane was used as an additional barrier protection as the schneiderian membrane was directly lifted and bone graft was placed beneath it. This was completely avoided by MCSL.

There was no significant difference in the primary stability, amount of sinus lift achieved or the rate of resorption of sub sinus bone, noted in both MCSL as well as lateral Window techniques.

SUMMARY AND CONCLUSION

The search for methods to avoid trauma and morbidity associated with lateral wall technique led to the evolution of crestal methods done in the most atraumatic way.

Different modifications of summer's osteotome technique were tried. We studied the predictability and feasibility of a new technique of crestal condensation (MOST CONSERVATIVE CRESTAL SINUS LIFT-MCSL) with conventional Lateral Window Technique.

In this study we found the following advantages for this new technique which appears promising for doing routine sinus lift in implant practice.

- Done as a day procedure under local anaesthesia.
- Minimally invasive technique using soft tissue punch to gain access to subsinus bone,
- Ensures faster wound healing and very minimal blood loss.
- No intra operative bone loss as trephined bone is not removed.

- No collagen membrane or any other biomaterials
- Native bone condensed apically to create bony bed beneath tented membrane.
- No bone graft used – no donor site morbidity and less treatment duration
- Lateral condensation of bone achieved using a larger diameter implant than trephine size.
- Less time consuming
- Immediate implant placement, so no second stage surgery needed
- Less time for prosthetic rehabilitation
- Less post operative complications and greater patient acceptance.

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IJOMI vol-23 No. 6, 2008.

ARMAMENTARIUM

Lateral Window Technique

Most Conservative Sinus Lift Technique

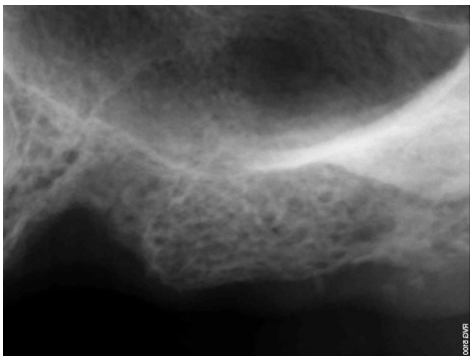


Fig L 1

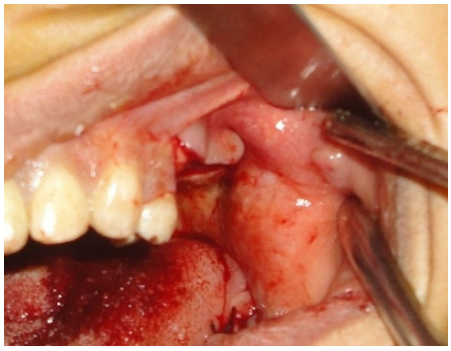


Fig L 2

Fig L 3

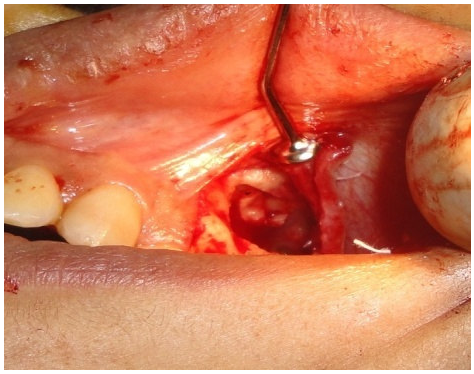


Fig L 4

Fig L 5

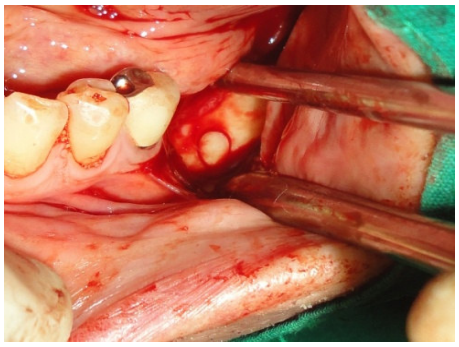


Fig L 6

Fig L 7

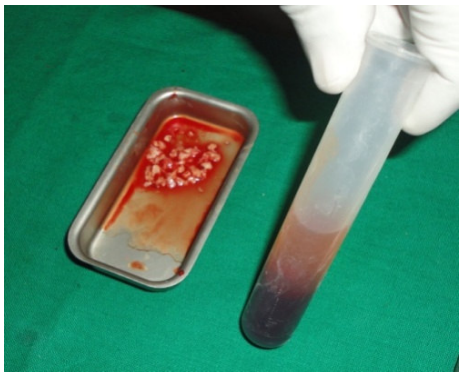
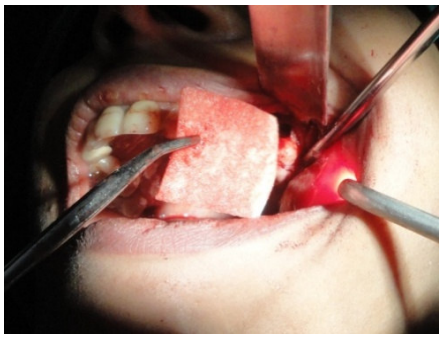


Fig L 8

Fig L 9



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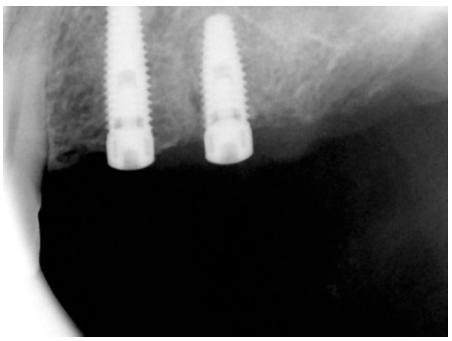


Fig L 11

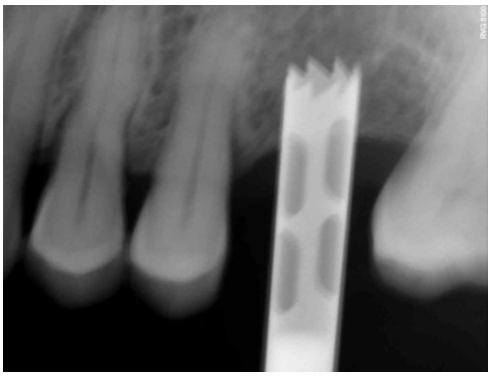
Fig L 12

Fig MC-1

Fig MC-2

Fig MC-3

Fig MC-4



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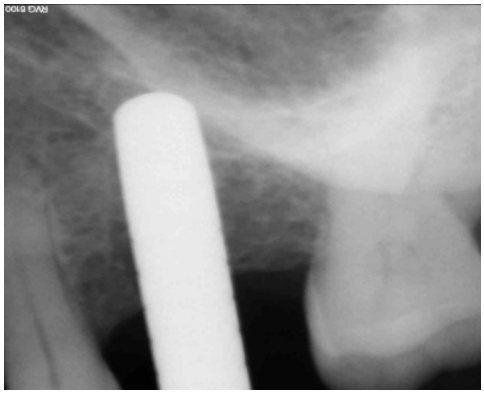

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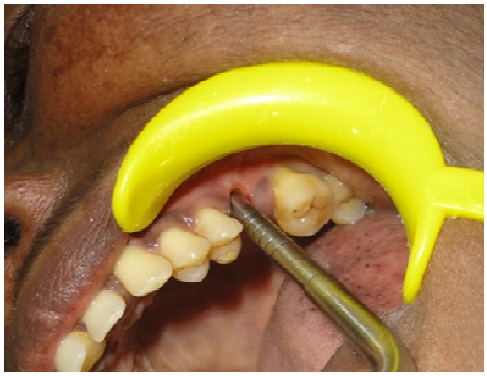

Fig MC-7

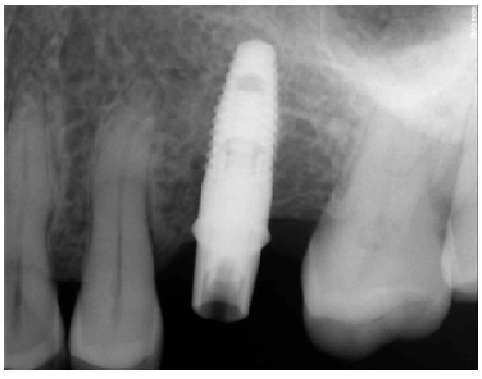

Fig MC- 8

FigMC-9

Fig MC-10

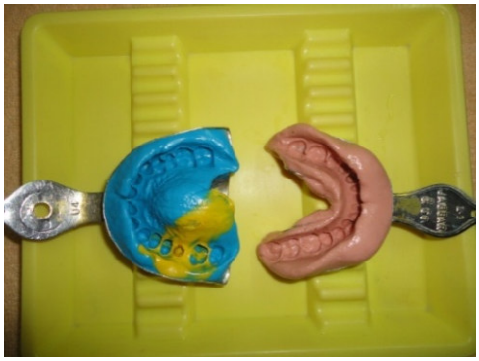

Fig MC-11

Fig MC-12